

## PLATE XVII.

- Fig. 1. *Phialidium cymbaloideum*, earliest free-swimming stage; p. 491. Valencia, 1895.  
 Fig. 2. *Phialidium cymbaloideum*, adult,  $\times 8$ ; p. 491. Valencia, 1895.  
 Fig. 2 a. Diagram of the margin of the umbrella.  
 Fig. 3. *Sophenia mirabilis*, an intermediate stage,  $\times 6$ ; p. 493. Valencia, 1895.  
 Fig. 4. *Phialidium temporarium*, earliest free-swimming stage,  $\times 22$ ; p. 489. Valencia, 1895.  
 Fig. 5. *Phialidium temporarium*,  $\times 8$ ; p. 489. Valencia, 1895.  
 Fig. 6. *Phialidium temporarium*, adult,  $\times 6$ ; p. 489. Port Erin, 1894.

### 3. On some Extinct Fishes of the Teleostean Family *Gonorhynchidæ*. By A. SMITH WOODWARD, F.Z.S.

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(Plate XVIII.)

In his well-known work 'Recherches sur les Ossements Fossiles' Baron Cuvier describes several fossil remains of fishes from the Upper Eocene gypsum of Montmartre, near Paris, which he briefly discusses with only provisional results and no definite names. Most of these have been redescribed by subsequent observers, who have had additional specimens and more satisfactory materials for comparison; and the systematic position of some of them is now determined with a considerable degree of certainty. One nearly complete specimen, however, which still remains *incertæ sedis*, has not hitherto received the attention it deserves; for it and a closely-allied form from the Eocene marls of Aix-en-Provence seem to belong to a nearly extinct family of Teleosteans (*Gonorhynchidæ*) which has not previously been known to occur in the European area.

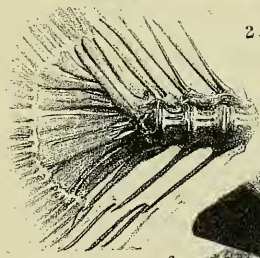
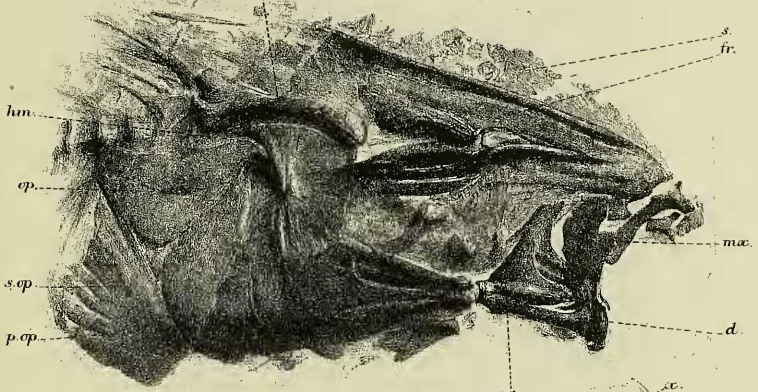
This fossil is first described in the second edition of the work in question (1822), and exhibits remains of all the skeletal parts of a fish about 0·2 m. in length. As Cuvier himself remarks, the disposition of the fins is very suggestive of that in the "*Gonorhynque* (*Cyprinus gonorrhynchus*, Gron.)"; while "the parts of the head which are observable indicate a Cyprinoid with prominent nose, such as the *Gonorhynque*, the *Cyprinus nasus* [= *Chondrostoma*], or a similar form." The small mouth, extended premaxilla, and absence of teeth are also noticed.

A more imperfect example, not improbably of the same species, from Montmartre, had previously been described by de Blainville under the name of *Anormurus macrolepidotus*<sup>1</sup>; and its scales were said to be remarkably similar to those of a larger fish made known at the same time from Aix-en-Provence and referred to a new species of *Cyprinus*, namely *C. squamosseus*. The dorsal fin was described as remote and comprising 14 or 15 rays. The jaws appeared to be toothless, and five broad branchiostegal rays could be counted.

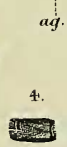
In 1844 the so-called *Cyprinus squamosseus* of de Blainville

<sup>1</sup> Nouv. Dict. d'Hist. Nat. vol. xxvii. (1818), p. 374.

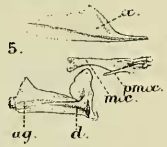
ot. 1.



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F.H. Michael del. et lith.

Mintern Bros. imp.

EXTINCT GONORHYNCHID FISHES.



became the type of the genus *Sphenolepis* of Agassiz<sup>1</sup>, and was then referred to the *Esocidæ*. The Montmartre specimen described and figured by Cuvier was also placed in the same genus under the name of *Sphenolepis cuvieri*; and since that date both these fishes seem to have been always quoted as related to the genus *Esocæ*.

A recent examination of the specimens of these two fishes in the British Museum has now convinced the present writer that Cuvier's original comparison of *Sphenolepis cuvieri* with *Gonorhynchus* was correct; that *Sphenolepis squamosseus* certainly belongs to the same genus; and that both these fishes are generically identical with *Notogoneus osculus* from the freshwater Green River Shales (Eocene) of Wyoming, U.S.A., which Professor Cope referred to the *Gonorhynchidæ* eleven years ago<sup>2</sup>. As the only surviving genus, *Gonorhynchus*, seems to be exclusively restricted to the seas bordering Japan, South Africa, Australia, and New Zealand, the discovery of an extinct freshwater ally both in Europe and America is one of some interest. It is thus important that the principal osteological characters of the known fossils should be clearly stated to justify the comparisons made.

1. NOTOGONEUS OSCULUS. (Plate XVIII. figs. 1, 2.)

1885-86. *Notogoneus osculus*, E. D. Cope, Amer. Nat. vol. xix. p. 1091; Mem. Nat. Acad. Sci. vol. iii. p. 163, pl. with figs. 4, 5.

*Formation and Locality.* Green River Shales (Eocene); Wyoming, U.S.A.

The North-American form *Notogoneus osculus* has already been well described by Cope, who also publishes a diagrammatic figure. A beautiful new specimen, however, lately acquired by the British Museum, permits the determination of a few additional features.

The head in this fossil, shown of the natural size in Pl. XVIII. fig. 1, is exposed directly from the side, and thus does not exhibit the hinder part of the cranial roof, which is fortunately well seen in the original specimen figured by Cope. The large and characteristic right frontal bone (*fr.*) is distinct, while the upper part of the otic region (*ot.*) is shown to be well ossified, and is evidently not entirely covered by the squamosal. The much-expanded hyomandibular (*hm.*) is exposed, except at its lower end; but the other elements of the suspensorium, as also those of the pterygo-palatine arcade, are too much crushed and fractured to be distinguishable. The articulation for the mandible, however, is distinct below the front border of the orbit, and portions of both rami are preserved, that of the left side thrown upwards a little above the right ramus. Though imperfect the bones here indicated can readily be determined by reference to the corresponding elements in the existing *Gonorhynchus* (Pl. XVIII. fig. 5). The articulo-angular bone (*ag.*) is almost fan-shaped, extending upwards immediately in front of the articulation into a large, bluntly-pointed process. The dentary (*d.*) is much larger than the latter element, truncated in front, with very short oral border, and rising into an enormous upwardly-

<sup>1</sup> Poiss. Foss. vol. v. pt. ii. (1844), p. 87.

<sup>2</sup> American Naturalist, vol. xix. (1885), p. 1091.

directed process. The left maxilla (*mx.*) is completely preserved, slightly arched in form, with a small ascending process near its anterior end, and a little expansion posteriorly. Of the right maxilla only a fragment of the anterior end remains. The premaxillæ are not shown, but the bone labelled "? barbel axis" in Cope's original specimen may be one of them. No teeth are exhibited in any part of the mouth. The preoperculum (*p.op.*) has a large lower limb and is much expanded at the angle. The operculum (*op.*) is imperfect above, but evidently trapezoidal in form and somewhat deeper than broad. The suboperculum (*s.op.*) is deeper behind than in front, and exhibits four deep clefts in the lower half of its hinder border. Small scales can be observed enveloping all the head and opercular bones.

The vertebral centra are much constricted and strengthened with small irregular longitudinal ridges. The ribs are remarkably slender, apparently supported by stout processes from the centra; while the separate neural spines in the anterior half of the abdominal region are expanded into thin narrow laminæ. The last vertebra of the tail (Pl. XVIII. fig. 2) bears an upwardly-turned double style, and there are seven expanded hæmal arches at the base of the caudal fin, the lowest apparently connected with the penultimate vertebral centrum, the next three with the last centrum, and the upper three with the terminal style. It is also worthy of note that the neural arch in the three vertebræ preceding the last is forked from the base. Intermuscular bones are seen above the vertebral column throughout, and below it in the caudal region.

The fins are as described by Cope, except that the pelvic pair is much larger than indicated in the original specimens. The scales are precisely similar in shape and denticulation to those of the existing *Gonorhynchus*.

## 2. NOTOGONEUS SQUAMOSSEUS. (Plate XVIII. figs. 3, 4.)

1818. *Cyprinus squamosseus*, H. D. de Blainville, Nouv. Dict. d'Hist. Nat. vol. xxvii. p. 371.

1844. *Sphenolepis squamosseus*, L. Agassiz, Poiss. Foss. vol. v. pt. i. p. 13, pt. ii. p. 87, pl. xlv.

*Formation and Locality.* Upper Eocene; Aix-en-Provence, France.

The so-called *Cyprinus* or *Sphenolepis squamosseus* is represented in the British Museum by several specimens, which, taken together, display nearly all its essential characters. The head with opercular apparatus is relatively much larger than in *Notogoneus osculus*, its length exceeding the maximum depth of the trunk, and contained only about four times in the total length of the fish; the vertebral centra are also much shorter; otherwise its specific characters seem to be identical with those of the American fish.

The best-preserved head belongs to a specimen wanting part of the abdominal region and the caudal fin, and is shown of two-thirds the natural size in Pl. XVIII. fig. 3. It is unfortunately very imperfect, but the enveloping small scales (*s.*) are exposed in a narrow band, both above and below. The much-fractured